

Installation Instructions

452

SIZE 90
Series D

GAS-FIRED AIR CONDITIONER

bryant

Cancels: 39452D30

39452D33
5/1/71

Important—Read before Installing

1. Check all local or other applicable codes for information concerning proximity to property lines, height above roof, obstructions, etc.
2. Be sure the power supply available (voltage, frequency, and phase) corresponds to that specified on the unit rating plate.
3. Check the electrical service provided by the utility for the building to be sure that the service capacity is sufficient to handle the load imposed by this unit.
4. Refer to the regulations of the serving gas supplier and the local building, heating, plumbing, or other codes in effect in the area in which installation is to be made.
5. Refer to the dimensional drawing on page 2 for location of electrical, gas, and chilled water connections prior to setting the unit in place.

GENERAL

Model 90-452 is a gas-fired air-cooled absorption unit designed to satisfy the cooling needs of commercial and industrial buildings. This absorption unit supplies chilled water for cooling with Bryant's indoor and outdoor coil assemblies.

Multiple Chillers and Cooling Coils

When it is planned to connect two or more chillers or coils, additional piping and electrical information is required. This information may be obtained from your local Bryant Distributor. Connecting the Model 452 in multiples with older model chillers is not recommended. This is undesirable because of differences in electrical characteristics, chilled water levels, pump head curve, etc.

Operation at Atmospheric Pressure

The chilled water tank on this unit is vented to the atmosphere; consequently, the chilled water circuit operates at atmospheric pressure. Therefore, conventional piping practices for a closed, pressurized system do not apply for this unit.

NOTE: When the water chiller is piped to a boiler as described below, the indoor coil operates at or near atmospheric pressure when used for cooling; the indoor coil may be pressurized when it is used with the boiler for heating.



Figure 1—Model 90-452 Gas Air Conditioner

When this chiller is piped with a boiler to form a combination heating and cooling system, provisions must be made for a positive shutoff between the chiller tank and the boiler.

When the boiler is in operation, the chiller tank must be by-passed. A sediment strainer must be installed at the chiller tank inlet when a common pipe connects the chiller tank and boiler.

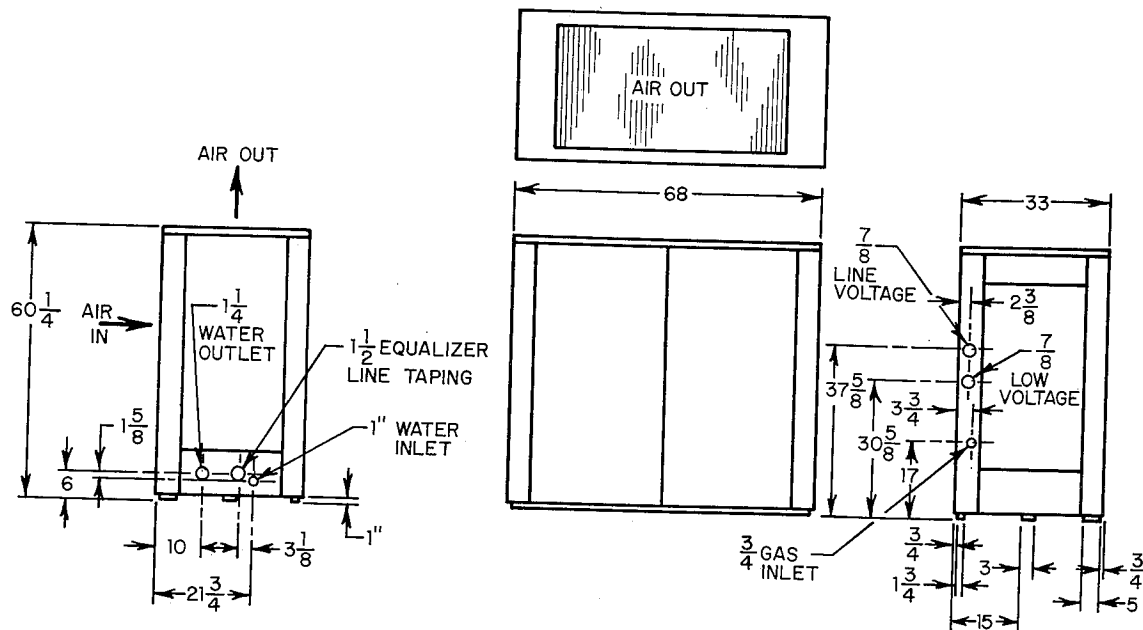
When the chiller is in operation the boiler, of course, should be by-passed.

Installation

Installation of the Model 90-452 Gas Chiller unit consists of the following steps:

- I. Locating and Mounting the Unit
- II. Connecting Chilled Water Lines
- III. Making Electrical Connections
- IV. Making Gas Connections
- V. Charging System with Water
- VI. Checking the Unit Operation
- VII. Adjusting Gas Input
- VIII. Balancing the System
- IX. Freezing Weather Protection

Each of the above steps is discussed in detail in this instruction. *Read the entire instruction before starting the installation.*



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Figure 2—Dimensional Drawing

RATINGS AND CAPACITIES

Model		90-452
Cooling Capacity		
Heat Input	BTUH	90,000
Gas Connection Size	BTUH	225,000
Condenser Air Delivery	Inches	3/4
Water Flow (Nominal)	CFM	10,000
Max. Friction Loss Handled by Chiller Pump	GPM	18.5
Fan Motor - 230V - 60Hz - 1 phase	Ft	37
Chilled Water Pump Motor - 230V - 60Hz - 1 phase	HP	1/2 (2)
Solution Pump Motor - 230V - 60Hz - 1 phase	HP	1/3
Unit Full Load Current Draw	HP	1-1/2
Approximate Shipping Weight	Amps	20.3
	Lbs	1320

I. LOCATING AND MOUNTING UNIT

The absorption unit is approved for outdoor installation only and may be located at ground level or on the roof. Consult local or other applicable codes for information concerning proximity to property lines, height above roof, obstructions, etc.

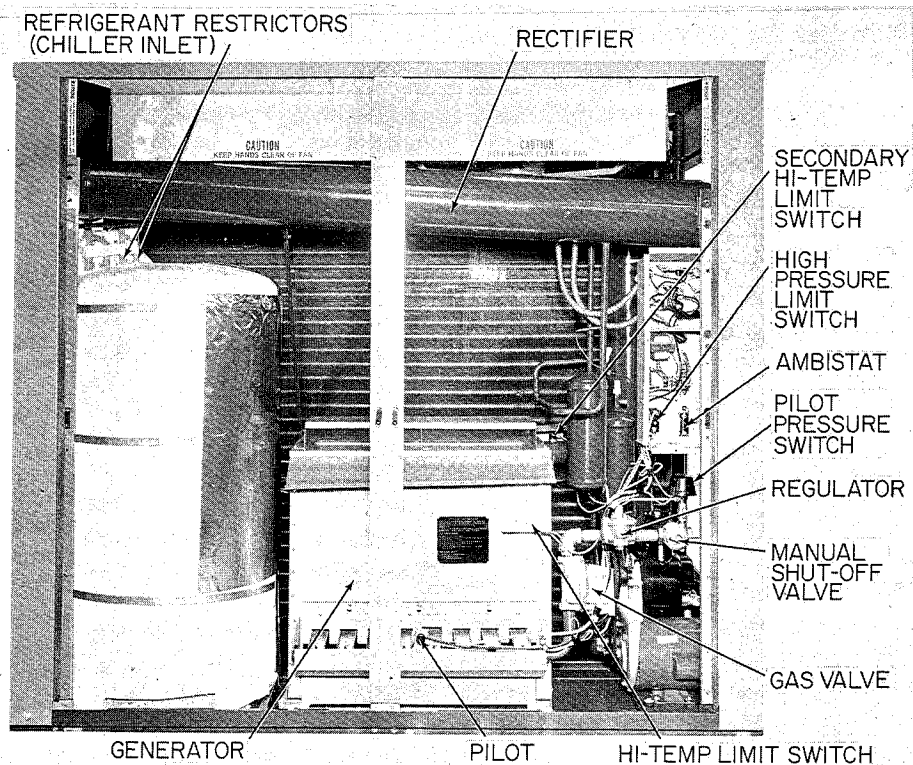
A. Mounting Base

1. USE NONCOMBUSTIBLE MATERIALS.
2. Suggested types of mounting base for ground installation:
 - a. Precast concrete lintels. Use three lintels the depth of unit, one each under right and left end of unit and one at center of unit.
 - b. Concrete blocks. Use one block at each corner of unit plus blocks under the two long sides midway between the corner blocks.
 - c. Concrete slab. Minimum thickness 4 inches.

3. Leave sufficient clearance (6 inches minimum) between unit base and roof for proper air circulation when installing unit on a roof. Use precast concrete lintels or concrete blocks as described in paragraph 2 above, or use steel beams. Check local codes. Refer to NBFU code for Installation of Heat Producing Appliances.

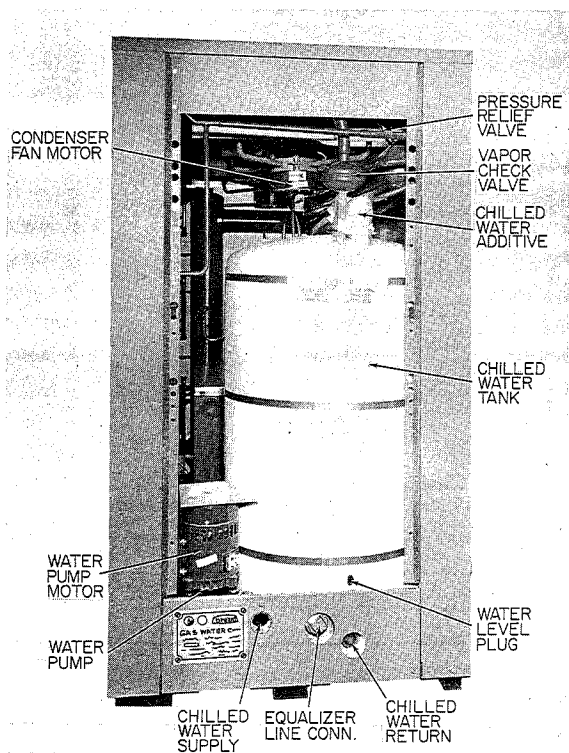
B. Clearances

1. Absorption unit should have a minimum clearance of 2 feet on all sides from any adjacent obstruction.
2. Avoid locating the unit where hot condenser air can impinge on nearby obstructions and mix with the inlet air supply. The condenser air discharges upward. The unit should be located outside of the plumb line from any overhang when the distance from the overhang to the top of the unit is less than 7 feet.



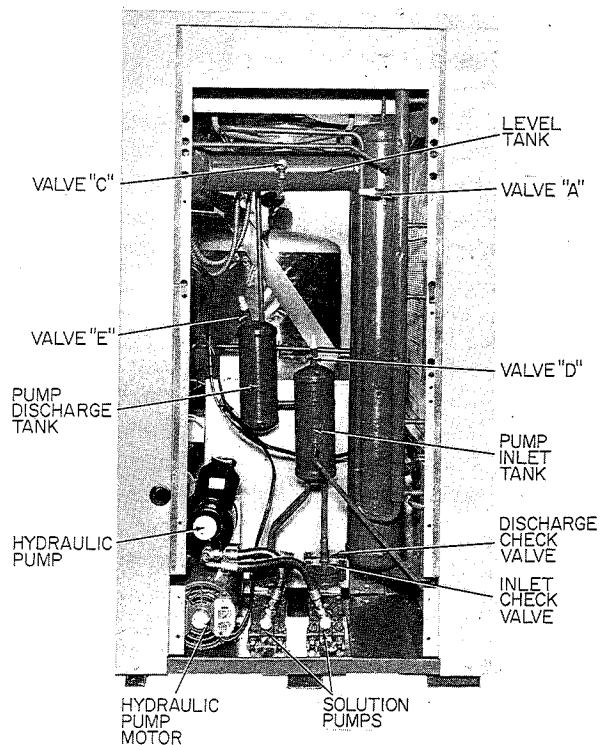
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Figure 3 – Unit Front View With Access Panels Removed



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Figure 4 – Unit Left Side View With Access Panel Removed



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Figure 5 – Unit Right Side View With Access Panel Removed

TABLE I

Nominal Pipe Size (Inches)	*Allowable Distance Between Coil & Chiller		
	Polyethylene Pipe (Feet)	Copper Pipe (Feet)	Galvanized Pipe (Feet)
1	30	51	54
1-1/4	205	165	220
1-1/2	490	388	492

*NOTE: Values shown in Table I are for one direction only. The total length of pipe from chiller to coil and return would be double the values given. The above Table applies to single unit installations only.

II. CONNECTING CHILLED WATER LINES

Refer to "Multiple Chillers and Cooling Coils," page 1; "Operation at Atmospheric Pressure," page 1; and "Freezing Weather Protection," page 9, before making any chilled water connections.

A. Materials

NOTE: Black iron pipe must not be used for chilled water piping. Refer to section on "Freezing Weather Protection" at the end of this instruction.

1. Piping

- Polyethylene Plastic Pipe - use medium density flexible pipe whose wall thickness approximates Schedule 40 pipe (Commercial Standard CS 255-63). Pipe must be virgin plastic. Do not use pipe manufactured from reclaimed plastic.
- Copper - satisfactory substitute.
- Galvanized - satisfactory substitute.

2. Fittings

- Galvanized - use when possible.
- Brass - satisfactory substitute.
- Nylon - satisfactory substitute.

B. Pipe Length and Diameter

Table I shows maximum length of pipe of different diameters that can be used between the pump discharge and the coil inlet and still maintain minimum allowable (design) water flow rate.

- Multiply table values by two to obtain the total length of pipe from chiller to coil and return.
- Length is measured along the pipe path and therefore includes vertical distance between the water coil and the chiller.
- Lengths shown in Table I are based on using a total of eight galvanized wellhead elbows in the entire water line (chiller to coil and return). Lengths are predicated on the use of a Bryant matching water coil. For greater distances, use larger pipe or add a pump. Consult your Bryant Distributor for additional information.

C. Insulation

- Insulate supply and return lines separately.
- Material should be of good quality and be covered with a good vapor barrier. Armaflex or equivalent is recommended.

Wall thickness: 1/2 inch.

D. Height of Coil above Absorption Unit

Practical coil elevation is limited only by the atmospheric pressure supported hydraulic head.

E. Water Coil Connections

- If cooling coil is used in connection with heating unit, and the heating unit is not approved for installation downstream from cooling coil, install cooling coil in parallel with or downstream of heating unit. This will avoid condensation in heating unit. If coil and heating unit are installed in parallel, the dampers or other means used to control flow of air should be adequate to prevent chilled air from entering the heating unit, and if manually operated, shall be equipped with means to prevent operating of either unit unless dampers are in full heat or cool positions.
- If coil is located in warm air stream, do not connect polyethylene pipe directly to coil. Connect a minimum of 24-inches copper or galvanized pipe to both the coil inlet and outlet. Then connect the plastic pipe to these nipples.
- Precautions must be taken to provide for water expansion on installations where the outside piping is subject to freezing temperatures and the coil is in a heated air stream. The connecting polyethylene plastic pipe acts as an expansion vessel if there is enough footage of this pipe in the heated space (space not subject to freezing temperatures). Table II shows the minimum lengths (total inlet and outlet) of plastic piping of various diameters that are required to provide adequate expansion volume.

TABLE II

Nominal Pipe Size (Inches)	Length of Plastic Pipe (Feet)
1	60
1-1/4	35
1-1/2	25

If the total plastic chilled water line footage in the heated space is not as long as the minimum value shown in Table II, tee off an additional length of polyethylene pipe to either side of coil to meet the required footage. Cap the open end of the added polyethylene pipe.

III. MAKING ELECTRICAL CONNECTIONS

1. Make all electrical connections in accordance with the National Electrical Code and any local ordinances or codes that might apply.
2. Provide a separate power supply for the air conditioner.
3. Provide a fused disconnect switch within sight of and not more than 50 feet from the absorption unit. Use 35-amp standard fuse or 20-amp fusetrone.
4. The unit is shipped from the factory completely wired. Connection of the 230-V power supply to the power relay is made directly into the control box through a knockout in the corner panel on the right side of the unit. The low-voltage (24V) wires from the thermostat control enter directly into the control box through a knockout in the panel on the right side. The low-voltage wires are connected at terminal block. See Figure 6 for location of control box components.

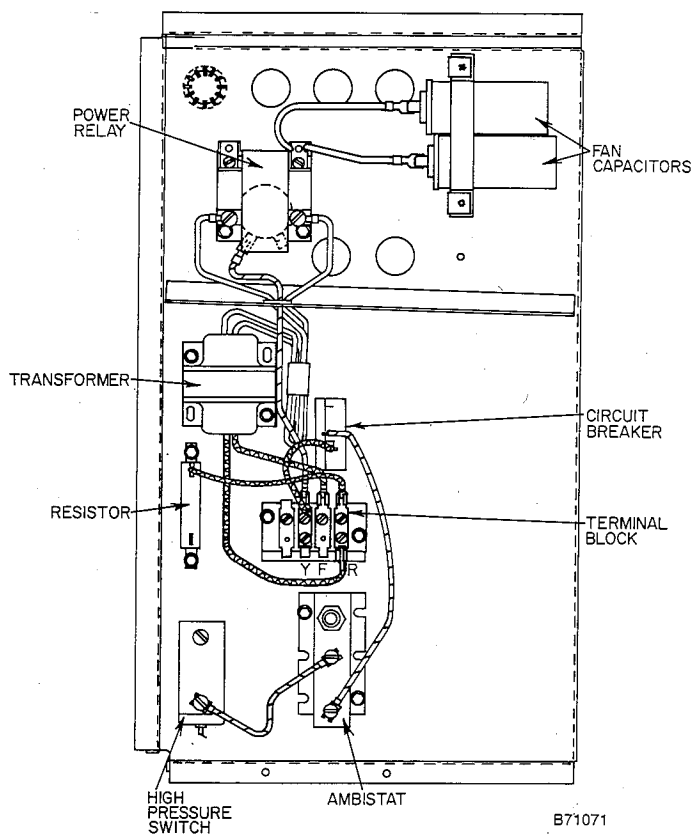


Figure 6—Control Box Components

5. Figure 9 is a wiring diagram of a natural gas unit. Figure 10 is a wiring diagram of a propane gas unit.
6. Disconnect chilled water pump electrical leads at the power relay in the control box before energizing the unit when ready to check field wiring. *Do not operate the pump dry.*

IV. MAKING GAS CONNECTIONS

Consult local gas company before making any gas connections. In case of conflict with this instruction, local requirements should be followed. This appliance is not suitable for use with conventional venting systems.

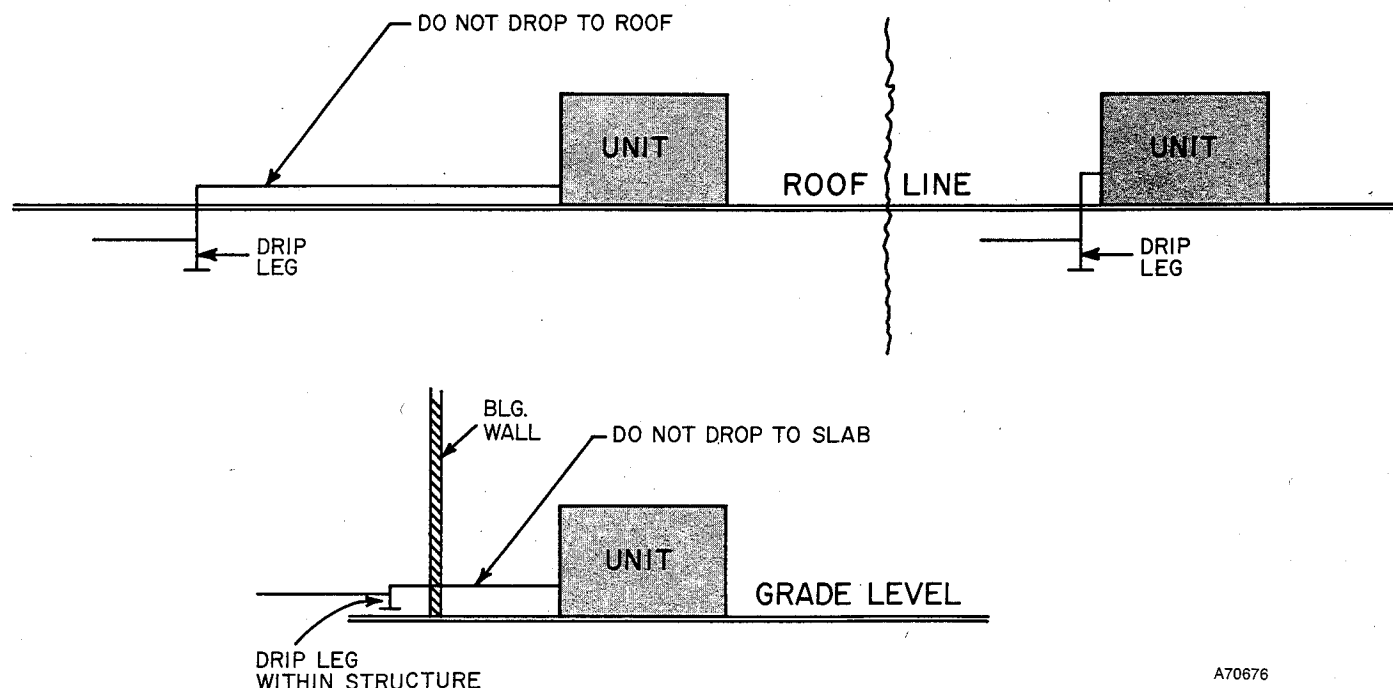
Before selecting the size and type of pipe that is to be used for installing the absorption unit, be sure to check with local gas company for the necessary information. The size of the gas pipe to be used between meter and unit will depend upon the length of run and the allowable pressure loss established by the utility.

The gas connection to the unit is made to the 3/4 inch shutoff valve at the control manifold. The supply pipe enters the unit through an opening in the corner panel on the right side. Install a drip leg trap in the gas supply riser leading to the unit.

The following are pertinent recommendations:

1. Avoid low spots in long runs of horizontal pipe. It is best to grade all pipe 1/4 inch for every 15 feet to prevent traps. All horizontal runs should grade up to risers. Risers should be used to connect to the unit and to the meter.
2. Install a drip leg in the riser leading to the unit. This drip leg will serve as a trap for dirt and condensate. Drip legs should be installed where condensate will not freeze. See Figure 7 for drip leg location.
3. A wrench-type shutoff valve should be installed in the gas supply line within sight of and convenient to the unit.
4. Place a ground joint union close to the unit between the gas controls manifold and the wrench-type shutoff valve.
5. Support all piping with appropriate hangers. The maximum distance between hangers should be 10 feet.
6. Joint compound (pipe dope) which is resistant to the action of propane gas should be applied sparingly and only to the male threads of the joints.
7. After all gas pipe connections are made, purge the lines and check for leakage. Turn off power supply to unit when purging the lines to prevent glow coil in reignition pilot from being energized. Use a soap and water solution for leak-checking.

WARNING: Never use matches, candles, or other sources of ignition to check for gas leakage.



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Figure 7 – Drip Leg Location

Pilot

The natural gas unit is equipped with a reignition-type pilot. The pilot will light automatically when supplied with gas and is electrically energized.

Light the pilot for both the natural gas and propane gas units using the procedure outlined on the lighting instruction plate attached to the generator. However, when lighting the pilot for the first time, perform the following additional steps:

1. If the supply line was not purged prior to connecting the unit, it will be full of air. Since it would take a long time to vent this air through the small pilot port, it is recommended that the pilot supply line be disconnected at the pilot shutoff valve and the supply line be allowed to purge until the odor of gas is detected. *Never purge gas lines into the combustion chamber.* Immediately upon detection of gas odor, reconnect the pilot supply tube. Allow 5 minutes to elapse and light the pilot in accordance with the instructions on the lighting plate.
2. The pilot flame should be soft blue in color.
 - a. For natural gas, this flame should be of sufficient length to provide good impingement on the unimetal of the Bryant pilot. Flame should extend upward between the carry-over ports of the two adjacent burners.
 - b. For propane gas, the flame should surround the tip of the thermocouple element of the pilot and extend downward to include 3/8 inch to 1/2 inch of the thermocouple. The flame must never come in contact with any other part of the thermocouple or its lead wire. The flame lies under the carry-over ports of the burners and merges with the carry-over flames.

3. If the pilot flame does not have the appearance described above, it may be adjusted by means of the manual pilot shutoff valve.

- a. The valve is equipped with an adjustable screw. Turn the handle to the full open position, and remove the screw cap to expose the adjustable screw. Turn adjusting screw until flame has the desired appearance.
- b. Replace screw cap.

V. CHARGING THE SYSTEM WITH WATER

Caution: Do not run the pump dry. Freezing conditions will not damage the pump; however, do not attempt to operate the pump when chiller or chilled water lines are frozen.

1. Turn off main manual gas shutoff valve.
2. Remove hand hole cover located on top of chiller tank. See Figure 8.
3. Disconnect water line at chiller inlet. (When installing the chilled water lines, it is advisable to leave this connection open until lines have been flushed.)
4. Fill tank with tap water until distributor pan at top is covered with water. A garden hose is useful for this filling operation.
5. Start pump. Continue to supply water to the tank and operate pump until all foreign matter has been flushed from the lines. Then remove hose.
6. Remove operating level drain plug and continue to operate pump until water stops flowing from drain opening. See Figure 8.

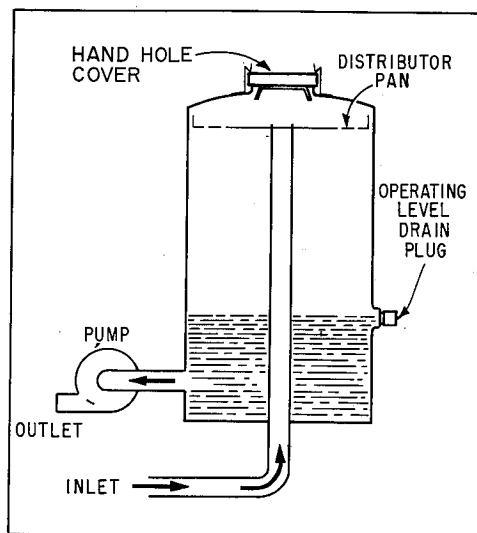


Figure 8—Chiller Tank

7. Turn off pump. Make pipe connection to chiller inlet.
8. Replace operating level drain plug. Add several gallons of water to tank to raise water level above drain opening.
9. Start pump. Adjust water level with pump running. This is accomplished by removing drain plug. When water ceases to drain, the level is properly adjusted.
10. Add contents of chilled water additive package to chiller tank through filler opening at top of tank. The package supplied is sufficient for chilled water systems containing up to 15 gallons of water. For systems larger than 15-gallon capacity, add one package for each additional 15-gallon capacity or fraction thereof. To estimate chilled water capacity of system, refer to Table III.
11. Replace hand hole cover.
12. The system is now ready to operate.

TABLE III
Water Capacity in Gallons

90-542 Chiller	9.7
Bryant 18,000 Btuh Coil	0.6
Bryant 36,000 Btuh Coil	1.0
Bryant 48,000 Btuh Coil	1.25
Bryant 90,000 Btuh Coil	2.5
1 ft. of 1-inch pipe	0.05
1 ft. of 1-1/4-inch pipe	0.08
1 ft. of 1-1/2-inch pipe	0.11

VI. CHECKING THE UNIT OPERATION

1. Be sure manual gas valve is off. Light pilot as described on Instruction Plate.
2. Turn on manual gas valve with the thermostat sub-base switch levers on "cool" and "auto." Set thermostat below room temperature. To check correct operation of electrical circuit, observe operation of gas valve, condenser fan motors, solution pump, and indoor fan. Set thermostat above room temperature and observe that unit shuts off properly.

3. Check indoor fan operation by setting thermostat sub-base fan switch lever to "on." The indoor fan should operate continually with the thermostat set above or below room temperature.
4. To place the system in operation, open the main manual gas valve, replace all panels, and set the thermostat at the desired temperature.

Control Circuit Description

Refer to Figures 9 and 10. Note that 24 volts (transformer secondary voltage) is applied to chiller terminals R and F whenever 230-volt power is supplied to the unit. When the thermostat calls for cooling, chiller terminal R is connected to chiller terminal Y through the thermostat.

Automatic Pilot Reignition

Only the natural gas unit (Figure 9) is equipped with the automatic pilot reignition feature. The propane unit (Figure 10) is equipped with a thermocouple pilot and must be lighted manually.

The automatic pilot reignition circuit consists of the one ohm resistor (11A), pilot pressure switch (7P), and the pilot and ignition coil assembly (6B). The pilot pressure switch (7P) contacts close when gas is turned on to the unit and current flows from chiller terminal R, through the one ohm resistor (11A), pilot pressure switch (7P), the glow coil of the pilot assembly (6B) via the pilot's normally closed contacts to chiller terminal F, and lights the pilot.

Approximately one minute after the pilot is ignited, heat from pilot will cause the pilot's normally open contacts to close and the normally closed contacts to open.

If the pilot should go out, the normally open pilot contacts (which were closed when the pilot was ignited) will reopen, de-energizing the power relay (2D) and the magnetic gas valve (5B). This will cause all motors (3A1, 3A2, 3C1 & 3C2) to stop and the gas valve to close. The normally closed pilot contacts (which were opened by heat from the pilot) will close and complete the current path to reignite the pilot.

Cooling Operation

Two current paths are provided from chiller terminal Y to chiller terminal F when the thermostat calls for cooling and the pilots are ignited as described above.

Current flows from chiller terminal Y, through the power relay winding (2D) and through the closed contacts of the pilot (6B) to chiller terminal F. The energized power relay winding (2D) causes the power relay contacts (2D) to close and starts the two fan motors (3C1 & 3C2), the solution pump motor (3A1), and the water pump motor (3A2).

Current also flows from chiller terminal Y, through the high-temperature limit switch (7H1), the closed contacts of the circuit breaker (2J), ambistat (7L), high-pressure switch (7A), secondary high-temperature limit switch (7H2), the gas valve coil (6B), and to chiller

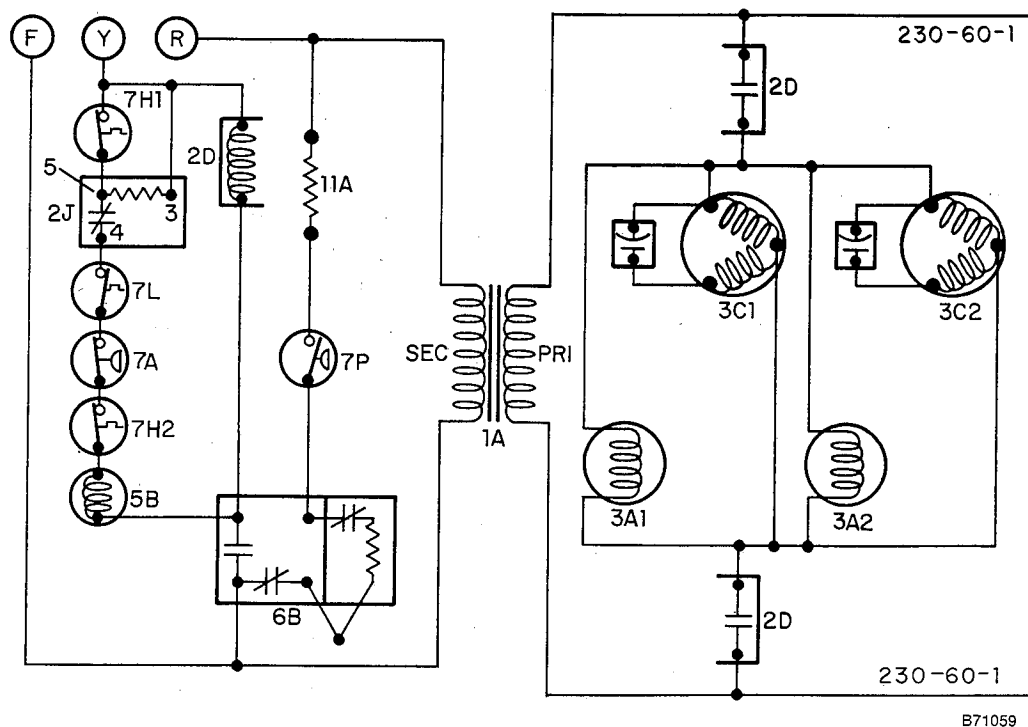


Figure 9 – Model 90-452 Wiring Diagram (Natural Gas Unit)

LEGEND

- | | | |
|------------------------------------|--|---|
| 1A Transformer | 3C1 Motor (Fan) (PSC) | 7H1 Limit Switch (High-Temp. Cont) (SPST) |
| 2D Power Relay (DPST) | 3C2 Motor (Fan) (PSC) | 7H2 Limit Switch (Sec High-Temp. Manual Reset) (SPST) |
| 2J Circuit Breaker (Lockout Relay) | 5B Gas Valve (Magnetic) | 7L Ambistat (Part Load Control) (SPST) |
| 3A1 Motor (Solution Pump) | 6A Pilot Relay (100% Shutoff) | 7P Press. Switch (Pilot Gas) (SPST) |
| 3A2 Motor (Water Pump) | 6B Pilot (Reignition) | 11A Resistor |
| | 7A High-Pressure Limit Switch (Auto. Reset) (SPST) | |

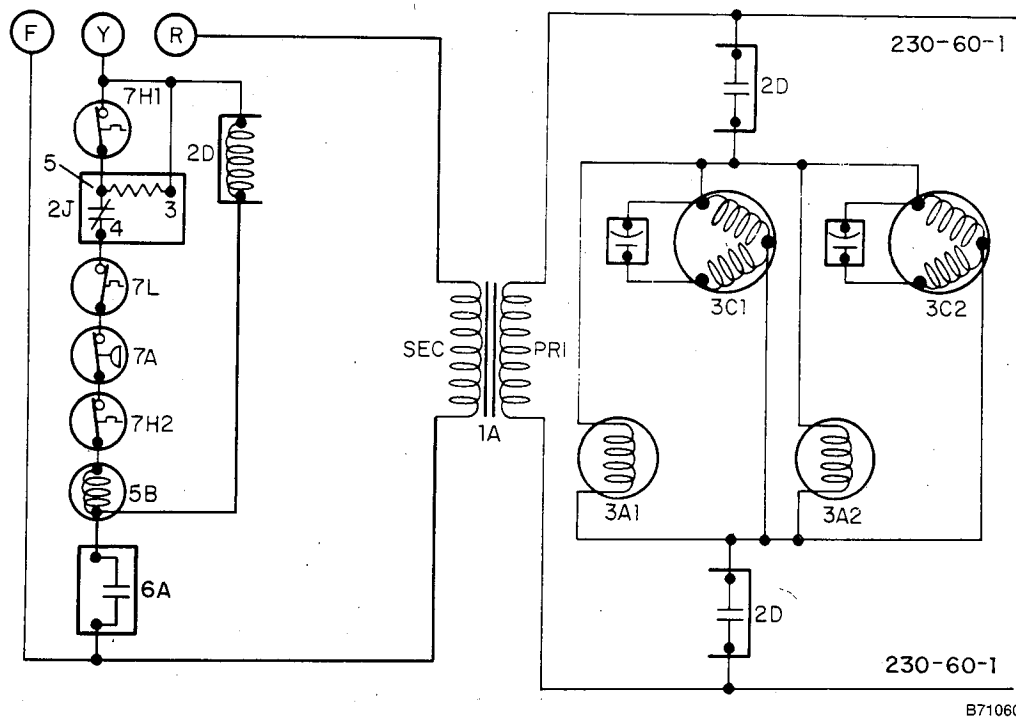


Figure 10 – Model 90-452 Wiring Diagram (Propane Gas Unit)

terminal F. The energized gas valve coil opens the gas valve and supplies gas to the generator burner.

Ambistat (Part Load Control)

The ambistat (7L) circuit is an automatic recycling type of temperature sensitive switch. Connected to the switch is a long capillary tube which is inserted in the chilled water supply line. The ambistat switch contacts open when the chilled water supply temperature drops below $40\pm 1^{\circ}\text{F}$. The opening of the ambistat switch contacts de-energizes the gas valve and shuts off the gas supply to the burner. The power relay (2D) remains energized and the fan motors (3C1 & 3C2), solution pump motor (3A1), and the water pump motor (3A2) will continue to run.

The ambistat switch contacts will close again when the chilled water temperature rises to $42\pm 1^{\circ}\text{F}$. The magnetic gas valve will be re-energized and turn the gas on again.

High-Temperature Cutoff

The high-temperature cutoff circuit includes a high-temperature limit switch (7H1), located in the front of the generator, plus a circuit breaker (2J) which is located in the control box.

If the generator becomes overheated, the high-temperature limit switch (7H1) will open, providing a current path through the heater element of the circuit breaker (2J). This current flow through the heater causes the normally closed contacts of the circuit breaker to open, removing the 24-volts potential from the magnetic gas valve. The de-energized gas valve will turn off the gas supply to the burner.

The circuit breaker is reset manually by pushing the red button that protrudes through the rear of the control box. The reset button is accessible by removing the right side access panel.

A secondary high-temperature limit switch (7H2) is connected in the Y leg of the control circuit to insure the closing of the gas valve in the event the generator overheats and the high-temperature limit switch (7H1) does not open. The secondary high-temperature limit switch is located on the generator heater and must be reset manually.

VII. ADJUSTING GAS INPUT

The gas input must be checked and adjusted if necessary to agree with that shown on the rating plate of the unit (225,000 Btuh). The burners are equipped with fixed orifices drilled as follows: Natural gas #39 drill; Propane gas #53 drill.

The natural gas units are equipped with adjustable gas pressure regulators set at factory for 3.0-inches w.c. manifold pressure. The propane gas units are not equipped with a pressure regulator.

Check natural gas units by one of the following methods:

1. Measure gas at meter. Be sure all other gas appliances are turned off. Increase or decrease input to burners by adjustment of the gas pressure regulator.
2. Set manifold pressure according to Table IV for the Btu value and specific gravity of the gas to be supplied to the unit. Connect manometer to 1/8-inch pressure tap on manifold, and with unit in operation, set correct pressure by adjustment of the gas pressure regulator.

Example: Natural Gas

1025 BTU

0.63 Specific Gravity

1. From Table IV manifold pressure is 3.2 inches w.c.
2. With manometer connected to manifold, set pressure at 3.2 inches by adjusting gas pressure regulator.

**TABLE IV—Manifold Pressure
(Inches w.c.)**

BTU Value	Specific Gravity					
		0.59	0.61	0.63	0.65	0.67
	900	3.9"	4.0"	4.1"	4.2"	4.3"
	950	3.5"	3.6"	3.7"	3.8"	3.9"
	1000	3.1"	3.2"	3.3"	3.4"	3.5"
	1025	3.0"	3.1"	3.2"	3.3"	3.4"
	1050	2.8"	2.9"	3.0"	3.1"	3.2"
	1100	2.6"	2.7"	2.8"	2.9"	3.0"

For manifold pressures exceeding 3.0 inches $\pm$.3 inches, consult local utility.

Check propane gas units as follows:

The burner orifices are sized for rated input with a manifold pressure of 11.0 inches w.c. Connect manometer to 1/8-inch pressure tap on unit manifold and adjust regulator at the supply tank to provide a manifold pressure of 11.0 inches w.c.

Caution: The unit may be run for short periods with the panel removed. Prolonged operation with panels removed should not be attempted.

VIII. BALANCING THE SYSTEM

After the unit is operating and the input has been measured and adjusted to agree with the rating plate requirements, balance the system.

Any approved method of checking the airflow over the water coil may be utilized. Reference is made to the Bryant Service Manual on Gas Air Conditioning for a review of standard methods. Do not purge noncondensibles or check solution level.

IX. FREEZING WEATHER PROTECTION

Gas Air Conditioner

The Gas Air Conditioner has built-in freezer protection sufficient to protect the chiller and pump plus a small amount of external hard (nonplastic) pipe as shown in Figure 11.

Chilled Water Pipes

If hard pipe (nonplastic) is used for the chilled water lines, it will be necessary to drain the lines or add anti-freeze. The recommended anti-freeze is methanol (uninhibited methyl alcohol). The chilled water additive must be used in the same proportion as indicated in Section V when anti-freeze treatment is required.

Chilled Water Coil

If water coil is subject to freezing temperatures, it will be necessary to protect the coil by the addition of anti-freeze. *Chilled water coils cannot be completely drained.* The chilled water additive must be used in the same proportion as indicated in Section V when anti-freeze treatment is required.

Chiller Operation Below 40°F

Hydraulic Pump Heater Kit (P/N 65134D01) is required to heat the hydraulic fluid if the chiller must be operated at temperatures below 40°F. This heater package permits winter operation of the chiller at outdoor temperatures down to -30°F. Methanol must also be

added to the chilled water circuit for protection at the lowest outdoor temperature. Consult your Bryant Distributor for recommended procedure.

Anti-Freeze, Type and Amount

Consult your Bryant distributor for the required type and amount of anti-freeze required for system or component protection.

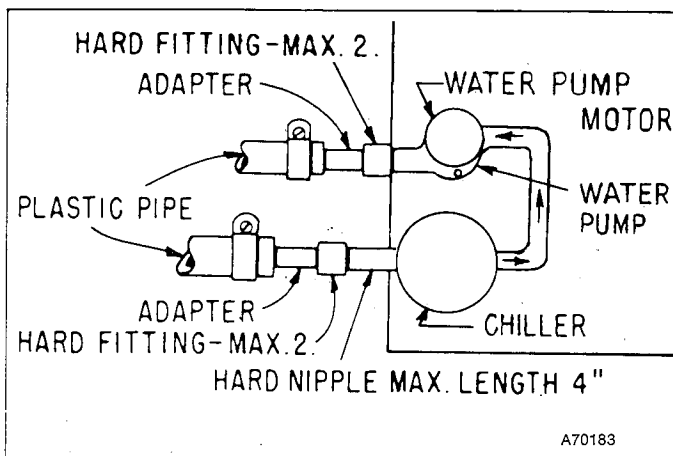


Figure 11 - Chiller Plan View

NOTE 1: Field wire from terminal "F" at chiller unit must extend through hole at furnace terminal "F" and connect to cooling relay as shown. If cooling relay is factory-installed, remove lead from terminal "X." strip end, and connect as shown.

NOTE 2: This wiring procedure will not allow manual fan operation if chiller unit power is turned off.

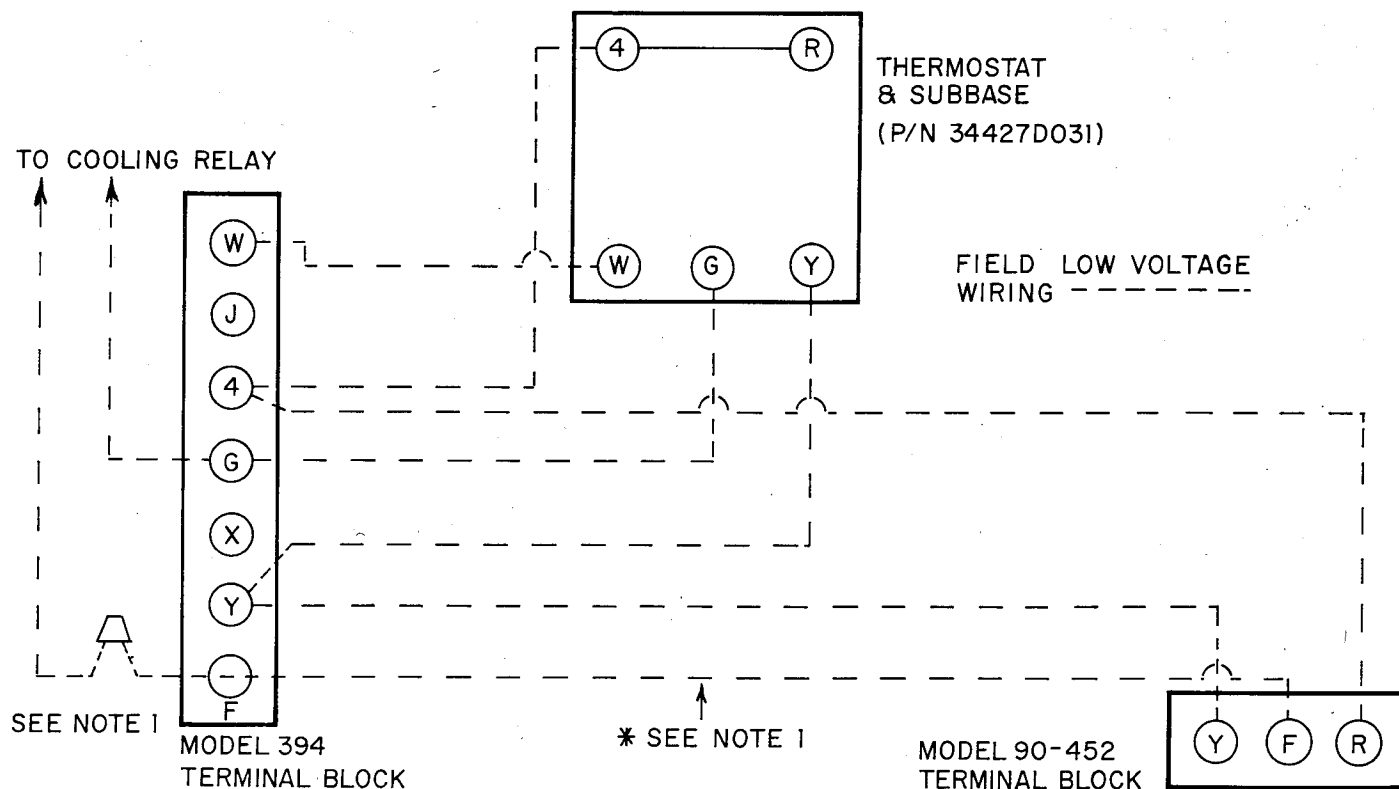
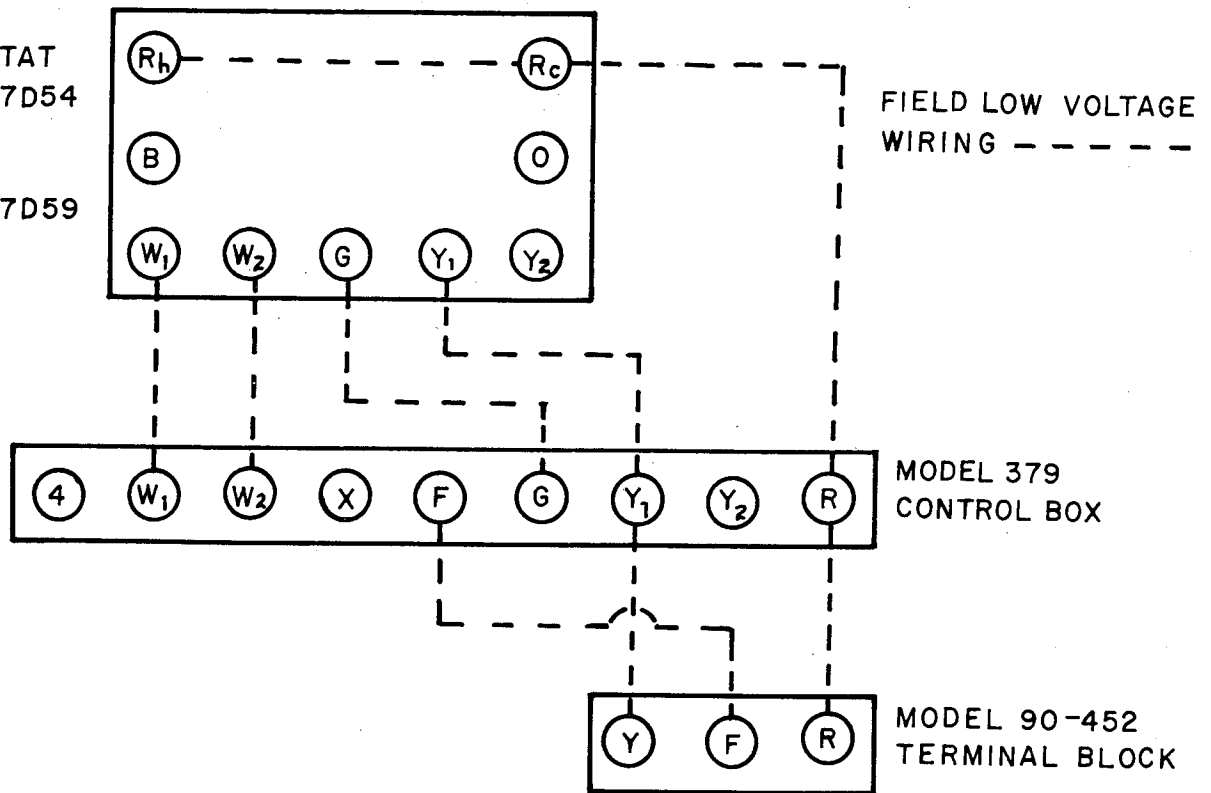


Figure 12 - Connecting the 90-452 Chiller to Model 190 or 220-394, Series E, F, or G Furnace

THERMOSTAT
P/N 34427D54

SUBBASE
P/N 34427D59

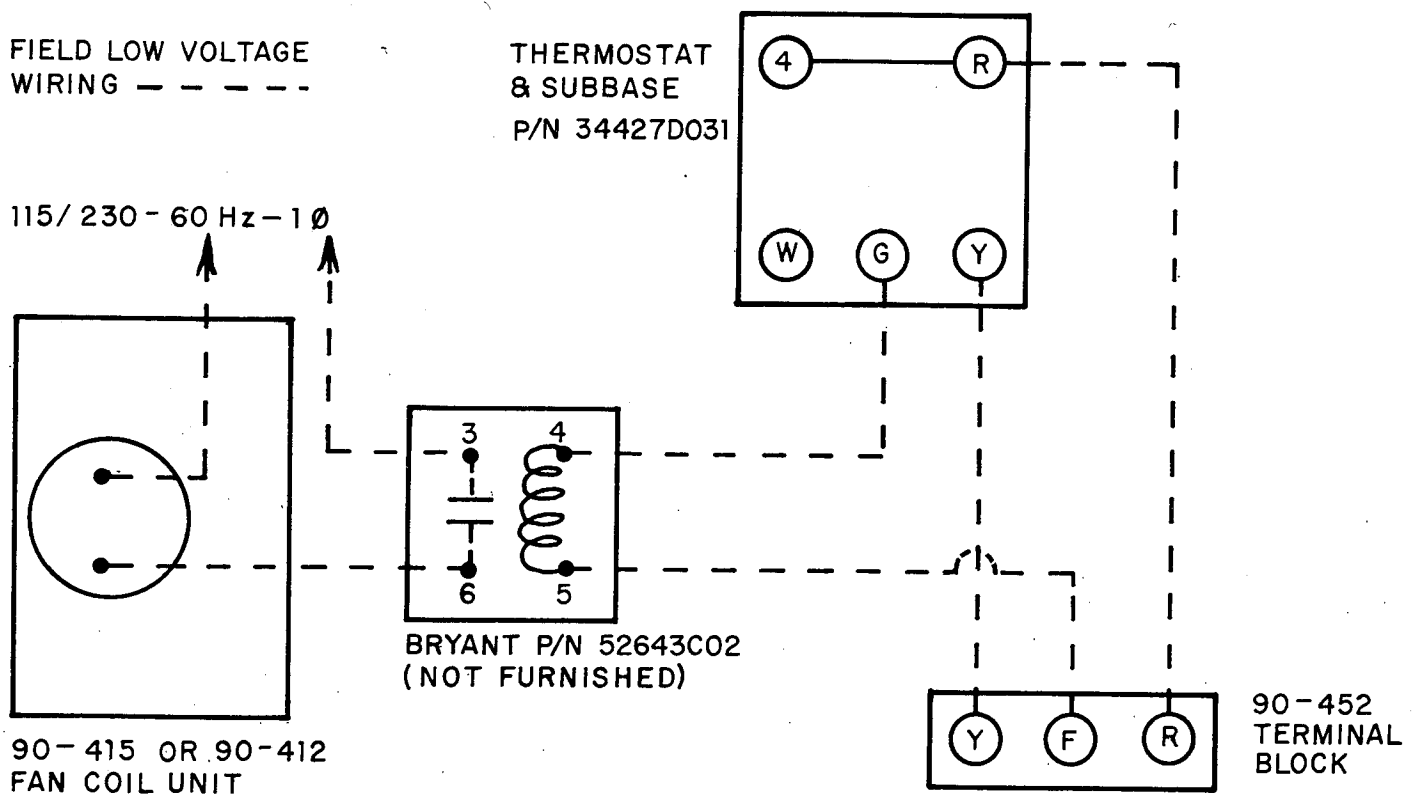


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Figure 13—Connecting the 90-452 Chiller to Model 90W-379 Furnace

FIELD LOW VOLTAGE
WIRING - - - - -

115/230 - 60 Hz - 1 Ø



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Figure 14—Connecting the 90-452 Chiller to Model 90-412 or 90-415 Fan Coil Unit